



MU123

Practice quizzes for Units 1 to 4 (Set 1)

Note that the questions in this document are designed for on screen usage via the course website. Some of the instructions within questions may not quite suit this printed version, e.g. when the question refers to 'box below' this should be interpreted as 'box in margin'.

Contents

Unit 1 practice quiz questions	2
Unit 2 practice quiz questions	5
Unit 3 practice quiz questions	9
Unit 4 practice quiz questions	12
Unit 1 practice quiz solutions	15
Unit 2 practice quiz solutions	18
Unit 3 practice quiz solutions	22
Unit 4 practice quiz solutions	26

Unit 1 practice quiz questions

Question 1

What is the correct answer for the following calculation?

$$4 + 4 \times 7$$

Answer:

Question 2

Select the option that is the value of the expression

$$4 \times 5 + 6 \times 7.$$

Options

A 61 B 308 C 41 D 69 E 62

Answer:

Question 3

Which two of the following quantities are equivalent to 1234 m?

Options

A 123400 cm B 1234000 cm C 0.1234 km D 12340000 cm
 E 123.4 km F 1.234 km G 12.34 km H 0.01234 km
 I 1234 cm J 12340 cm

Answer:

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Question 4

Round 9.85805 to various numbers of decimal places to make the following statements true.

9.85805 rounded to 4 decimal places is

9.85805 rounded to 2 decimal places is

9.85805 rounded to 1 decimal place is

Options

A 9.8580 B 9.858 C 9.9 D 9.85 E 9.859
 F 9.8581 G 9.8 H 9.86

Question 5

2 adults and 2 children are going out to a theme park, which charges an entrance fee of £6.75 for adults and £3.75 for children. Give an estimate to the nearest pound for the amount which it will cost for all the tickets.

(Your answer should be a number, without a £ sign.)

Answer:

Question 6

Select the correct answer to the following calculations from the drop down list.

$3 - (-5) \dots\dots\dots$

$3 + (-5) \dots\dots\dots$

$(-3) \times (-5) \dots\dots\dots$

$3 \times (-5) \dots\dots\dots$

$20 \div (-5) \dots\dots\dots$

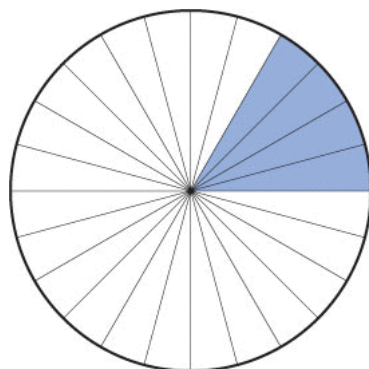
Options

A -15 **B** 2 **C** 15 **D** -2 **E** -8

F 4 **G** -4 **H** 8

Question 7

In a school class election for form captain, 24 students were entitled to vote. The figure below shows how many of them actually voted. The number of blue sectors represent those who voted and the number of white sectors represent those who did not.



Select the option that corresponds to the fraction of eligible voters who actually voted in its simplest form.

Options

A $\frac{5}{24}$ **B** $\frac{1}{8}$ **C** $\frac{5}{6}$ **D** $\frac{4}{24}$ **E** $\frac{1}{6}$

Answer:

Practice quizzes for Units 1 to 4 (Set 1)

Question 8

In a survey of 500 children, 300 said they preferred ice cream to chocolate.

Calculate, in simplest terms, the fraction of children who preferred ice cream to chocolate and select the numerator and denominator of this fraction from the drop-down lists below.

Numerator:

Denominator:

Options

A 45	B 6	C 3	D 9	E 2
F 500	G 30	H 25	I 35	J 8
K 7	L 40	M 15	N 300	O 4
P 5	Q 10	R 1	S 20	

Question 9

In a group of 25 adults, $\frac{2}{5}$ of them said that bingo was their favourite game. How many of the adults had different favourite games? Enter your answer in the box below.

(Your answer should be a number.)

Answer:

Question 10

Express the fraction $\frac{2}{3}$ as a decimal, rounded to two decimal places.

Enter your answer in the box below.

Answer:

Question 11

A shirt costs £40 and then the price is reduced by 25% in a sale. Calculate the reduced price of the shirt.

(Give your answer as a number, without a £ sign.)

Answer:

Question 12

How many iCMAs are there in MU123?

Answer:

Unit 2 practice quiz questions

Question 1

A map scale is given in words as: '1 cm represents 5 km'.

What is the scale factor?

(Your answer should be a number.)

Answer:

Question 2

A map scale is given as 1:1250.

What distance in kilometres is represented by 1 cm on the map?

(Your answer should be a number, without units.)

Answer:

Question 3

The scale of a map is 1:10000.

The distance between two places on the map is 1.9 cm.

What is the corresponding ground distance in km?

(Your answer should be a number, without units.)

Answer:

Question 4

The scale of a map is 1:10000.

The distance between two places on the ground is 0.25 km.

What is the corresponding map distance in mm?

(Your answer should be a number, without units.)

Answer:

Question 5

A car travels 10 km in 20 minutes.

What is the average speed of the car in km/h?

(Your answer should be a number, without units.)

Answer:

Question 6

A sponsored walk of 2.2 km started at 2:35 pm and finished at 3:13 pm.

What was the average speed in kilometres per hour, rounded to two significant figures?

(Your answer should be a number, without units.)

Answer:

Practice quizzes for Units 1 to 4 (Set 1)

Question 7

Find the time for a journey of 20 km travelled at an average speed of 55 km/h.

Give your answer in minutes, to the nearest minute.

(Your answer should be a number, without units.)

Answer:

Question 8

Convert the speed of 7 m/s to km/h.

Give your answer to the nearest whole number.

(Your answer should be a number, without units.)

Answer:

Question 9

The measurement 18.2 has been rounded to 3 significant figures.

The inequality for the values which round to 18.2 is (where v represents a value):

Options

A $18.15 \geq v > 18.25$

B $18.1 > v \geq 18.3$

C $18.15 < v \leq 18.25$

D $18.1 \leq v < 18.3$

E $18.15 \leq v < 18.25$

Answer:

Question 10

Choose the description from the drop down list that correctly matches each of the following expressions.

$2x + 5$

$(x - 4)^2$

$2(x + 5)$

$x^2 - 4$

Options

A Multiply your number by 2 and then by 5.

B Add 5 to the number and multiply your answer by 2.

C Subtract the number from 4, then square your answer.

D Multiply the number by 2 and then add 5.

E Subtract 4 from the number and then square your answer.

F Square the number and then subtract 4.

G Square the number, then subtract 4 squared.

Question 11

What is the value of

$$(x - 2)^2 + 3x + \frac{4}{x}$$

when $x = -2$?

(Your answer should be a number.)

Answer:

Question 12

Let $x = 2$.

Work out the values of the following expressions and choose the correct option (rounded where appropriate) from the drop down boxes:

$$5(6 + 3x) \dots\dots\dots$$

$$(5x)^2 \dots\dots\dots$$

$$(6x + 3)^2 \dots\dots\dots$$

$$\frac{5x}{6} \dots\dots\dots$$

$$\frac{5}{x+6} \dots\dots\dots$$

Options

- | | | | | |
|---------------|-------------|---------------|--------------|---------------|
| A 153 | B 60 | C 33 | D 36 | E 66 |
| F 225 | G 20 | H 0.63 | I 100 | J 1.67 |
| K 2.83 | L 21 | M 8.5 | | |

Question 13

The monthly cost for a mobile phone is given by the formula:

$$C = 5 + 0.1n$$

where C is the cost in £ and n the number of minutes used.

If 32 minutes are used in the month, what is the cost in £ for that month?

(Your answer should be a number, without units.)

Answer:

Question 14

From the following list, select the two statements which are correct.

Options

- A $-4 > -1$ B $-4 < -1$ C $-4 = -1$
D $-1 > -4$ E $-1 < -4$

Answer:

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Question 15

According to the United Nations Economic Commission for Europe Regulation No 39, a speedometer should never display a speed LESS THAN the true speed nor MORE THAN the true speed plus one tenth of the true speed plus 4 km/h.

If the true speed is 30 km/h, select the one inequality below for the range of speeds, v km/h that can be displayed on the speedometer (to the nearest whole number).

Options

- A $34 \leq v \leq 37$
B $34 < v < 37$
C $30 \leq v \leq 37$
D $30 > v > 37$
E $v < 30$ and $v > 37$
F $30 \leq v < 37$
G $30 \leq v \leq 34$

Answer:

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Unit 3 practice quiz questions

Question 1

What is the largest prime factor of 24?

(Your answer should be a number.)

Answer:

Question 2

Using prime factors or otherwise, find the lowest common multiple (LCM) of 36 and 75.

(Your answer should be a number.)

Answer:

Question 3

Choose the option which is the result of simplifying $3^3 \times 3^4 \times 3^5$.

Options

- A 3^{-6} B 3^7 C 3^{60} D 3^{12}

Answer:

Question 4

Choose the option which is the result of simplifying $\frac{11^3 \times 11^4}{11^5}$.

Options

- A 11^{60} B $11^{12/5}$ C 11^7 D 11^2

Answer:

Question 5

Carry out the following calculation.

$$\frac{5}{6} - \frac{4}{9}$$

Select the option that gives the answer as a fraction in its simplest form.

Options

- A $-\frac{1}{3}$ B $\frac{7}{18}$ C $\frac{23}{18}$ D $\frac{21}{54}$ E $\frac{69}{54}$

Answer:

Question 6

Divide $12\frac{2}{3}$ by $1\frac{1}{5}$ and select the option that gives the answer as an improper fraction in its simplest form.

Options

- A $\frac{228}{15}$ B $15\frac{1}{5}$ C $\frac{76}{5}$ D $\frac{95}{9}$ E $\frac{190}{18}$ F $10\frac{5}{9}$

Answer:

Practice quizzes for Units 1 to 4 (Set 1)

Question 7

What is the reciprocal of $\frac{4}{5}$? Write your answer as a decimal number, rounded to two decimal places if necessary.

Answer:

Question 8

What is the value of the power of 10 when the number 402 000 is expressed in scientific notation?

Answer:

Question 9

What is the result of the following calculation, expressed in scientific notation?

$$(7.3 \times 10^{-2}) \times (3.6 \times 10^{-3})$$

Options

- A 2.628×10^{-4} B 2.628×10^1 C 2.628×10^{-5}
D 0.2628×10^{-3} E 26.28×10^{-5}

Answer:

Question 10

What is the result of the following calculation, expressed in scientific notation? Choose the answer that is correct to four decimal places.

$$\frac{(7.3 \times 10^{-2}) \times (3.6 \times 10^{-3})}{9.9 \times 10^4}$$

Options

- A 2.6545×10^{-9} B 0.2655×10^{-10} C 26.5455×10^{-8}
D 2.6545×10^{-5} E 2.6545×10^{-1}

Answer:

Question 11

The number $\sqrt{18}$ simplifies to a number of the form $\square\sqrt{2}$. What is the value of the number in front of the square root?

Answer:

Question 12

Select the option that gives the simplified form of $8\sqrt{10} \times 7\sqrt{6}$.

Options

- A $2\sqrt{15}$ B $112\sqrt{15}$ C $224\sqrt{15}$ D $56\sqrt{60}$ E $56\sqrt{15}$

Answer:

Question 13

The sum of £300 is to be shared between two people in the ratio 3:2.

Select the option that gives the corresponding amounts received, to the nearest pound.

Options

- A** £100, £150 **B** £180, £120 **C** £150, £100
D £100, £200 **E** £120, £180

Answer:

Unit 4 practice quiz questions

Question 1

Which **two** of the following activities correspond to the 'P' stage of the PCAI cycle?

Options

- A Collect more data.
- B Write a report summarising your conclusions.
- C Search the internet for information.
- D After analysing your data, decide whether you need to interview more people.
- E Deciding which measure of pain is the most useful to use in a medical trial.
- F Narrow down a general question and make it specific.
- G Compare the averages of two sets of test scores.
- H Drawing a graph of the speeds of cars measured.

Answer:

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Question 2

Which **three** of the following variables are continuous?

Options

- A higher education degree classification
- B membership (or not) of a country in the European Union
- C number of births in Basel in 1968
- D length of time from cancer diagnosis to remission
- E temperature at which a chemical reaction occurs
- F percentage of a person's body weight which is fat

Answer:

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Question 3

What is the mean of the following set of data values?

8, 4, 9, 0, 6, 4, 8, 3.

Give your answer as a decimal number correct to **two** decimal places.

Answer:

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Question 4

What is the median of the following set of data values?

1, 2, 6, 8, 2.

(Your answer should be a number.)

Answer:

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Question 5

What is the median of the following set of data values?

2, 7, 32, 34, 35, 54, 56, 654.

Answer:

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(Your answer should be a number.)

Question 6

Using the course tool Dataplotter (which can be accessed on the course website), what is the mean of the data values listed below?

Give your answer as a decimal number correct to **one** decimal place.

Answer:

130
216
131
23
149
339
31
212
349
337
226
135
115
226
336
24

Question 7

What is the range of the following set of data values?

1, 8, 0, 3, 6.

(Your answer should be a number.)

Answer:

Question 8

What is the first quartile of the following data set?

1, 2, 6, 8.

(Your answer should be a number.)

Answer:

Question 9

What is the third quartile of the following data set?

8, 1, 3, 5.

(Your answer should be a number.)

Answer:

Question 10

What is the interquartile range of the following data set?

7, 3, 1, 5.

(Your answer should be a number)

Answer:

Question 11

Using Dataplotter (which can be accessed on the course website), find the range of the following set of data values and give your answer below.

Answer:

30
16
30
2
49
39
2
12
49
37
26
35
15
26
36
24
8
14
23
46

(Your answer should be a number.)

Unit 1 practice quiz solutions

Solution 1

Correct answer :

Using the BIDMAS rule we can evaluate the expression in steps starting with multiplication, then the addition.

$$\begin{aligned} 4 + 4 \times 7 &= 4 + 28 \\ &= 32 \end{aligned}$$

See Unit 1, Subsection 2.1.

Solution 2

Correct option :

The solution is worked out stepwise using BIDMAS as follows

$$\begin{aligned} 4 \times 5 + 6 \times 7 \\ &= 20 + 42 \\ &= 62 \end{aligned}$$

See Unit 1, Subsection 2.1.

Solution 3

Correct option :

Correct option :

Since 1 m = 0.001 km,

$$1234 \text{ m} = (1234 \times 0.001) \text{ km} = 1.234 \text{ km}.$$

Also, 1 m = 100 cm,

$$1234 \text{ m} = (1234 \times 100) \text{ cm} = 123400 \text{ cm}.$$

The two correct answers are thus 1.234 km and 123400 cm.

See Unit 1, Subsection 2.3.

Solution 4

Matching pairs:

9.85805 rounded to 4 decimal places is	9.8581
9.85805 rounded to 2 decimal places is	9.86
9.85805 rounded to 1 decimal place is	9.9

Rounding 9.85805 to four decimal places gives 9.8581.

Rounding 9.85805 to two decimal places gives 9.86.

Rounding 9.85805 to one decimal place gives 9.9.

See Unit 1, Subsection 2.4.

Solution 5

Correct answer :

Practice quizzes for Units 1 to 4 (Set 1)

There are many ways of making a quick estimate of the cost. This answer presents one way of doing this where we first round the entrance fees to the nearest pound.

In this question both of the given prices round upwards to the next whole pound to give approximately 7 for the adult entrance fee and 4 for the child entrance fee.

So the estimated cost for the 2 adults is $2 \times 7 = 14$ pounds.

The estimated cost for the 2 children is $2 \times 4 = 8$ pounds.

So the estimated cost is $14 + 8 = 22$ pounds.

(Your answer will be marked correct for estimates around this figure, as there is not a precise answer to this question.)

See Unit 1, Subsection 2.5.

Solution 6

Matching pairs:

$3 - (-5)$	8
$3 + (-5)$	-2
$(-3) \times (-5)$	15
$3 \times (-5)$	-15
$20 \div (-5)$	-4

To subtract a negative number, we add the corresponding positive number, so

$$3 - (-5) = 3 + 5 = 8.$$

To add a negative number, we subtract the corresponding positive number, so

$$3 + (-5) = 3 - 5 = -2.$$

When two negative numbers are multiplied together the answer is positive, so

$$(-3) \times (-5) = 15.$$

When a positive number is multiplied by a negative number the answer is negative, so

$$3 \times (-5) = -15.$$

When a positive number is divided by a negative number the answer is negative, so

$$20 \div (-5) = -4.$$

See Unit 1, Subsection 3.1.

Solution 7

Correct option : ☐ E

4 of the 24 children voted, which gives a fraction $\frac{4}{24}$.

This fraction is not in its lowest terms since the numerator and denominator of the fraction have 4 as a common factor.

Dividing the numerator and denominator by 4 gives the fraction in its lowest terms as $\frac{1}{6}$.

See Unit 1, Subsection 3.2.

Solution 8

Matching pairs:

Numerator:	3
Denominator:	5

The fraction of children who preferred ice cream to chocolate is $\frac{300}{500}$.

The numerator and denominator of this fraction have a common factor of 100.
Dividing through by this common factor gives the fraction in simplest terms as $\frac{3}{5}$.

So the numerator of the fraction is 3 and the denominator is 5.

See Unit 1, Subsection 3.2.

Solution 9

Correct answer : 15

$\frac{2}{5}$ of the 25 adults said bingo was their favourite.

This gives $25 \times \frac{2}{5} = 5 \times 2 = 10$ adults who said that bingo was their favourite game.

This leaves $25 - 10 = 15$ who prefer other games.

See Unit 1, Subsection 3.2.

Solution 10

Correct answer : 0.67

The fraction $\frac{2}{3}$ when expressed as a decimal number is 0.6666666667.

Rounding this to two decimal places, the required answer is 0.67.

See Unit 1, Subsection 3.2.

Solution 11

Correct answer : 30

If the price is reduced by 25 percent then since $100 - 25 = 75$ we have that 75 percent of the price remains.

So the final price (in £) is:

$$40 \times \frac{75}{100} = 30.$$

See Unit 1, Subsection 3.3.

Solution 12

Correct answer : 5

The course contains 5 iCMAs.

See either the Course Guide or the Course Website.

Unit 2 practice quiz solutions

Solution 1

Correct answer :

1 cm on the map represents 5 km on the ground.

$$\begin{aligned} 5 \text{ km} &= (5 \times 1000) \text{ m} \\ &= 5000 \text{ m} \\ &= (5000 \times 100) \text{ cm} \\ &= 500000 \text{ cm.} \end{aligned}$$

Thus the map scale is 1:500000 and so the scale factor is 500000.

See Unit 2, Subsection 1.2.

Solution 2

Correct answer :

1 cm on the map represents 1250 cm on the ground.

Now,

$$\begin{aligned} 1250 \text{ cm} &= (1250 \div 100) \text{ m} \\ &= 12.5 \text{ m} \\ &= (12.5 \div 1000) \text{ km} \\ &= 0.0125 \text{ km.} \end{aligned}$$

So the distance on the ground is 0.0125 km, and the map scale could be written:

‘1 cm represents 0.0125 km’.

See Unit 2, Subsection 1.2.

Solution 3

Correct answer :

The ground distance is:

$$\begin{aligned} (1.9 \times 10000) \text{ cm} &= 19000 \text{ cm} \\ &= (19000 \div 100 \div 1000) \text{ km} \\ &= 0.19 \text{ km.} \end{aligned}$$

So the distance on the ground is 0.19 km.

See Unit 2, Subsection 1.2.

Solution 4

Correct answer :

The ground distance is:

$$\begin{aligned} 0.25 \text{ km} &= (0.25 \times 1000 \times 1000) \text{ mm} \\ &= 250000 \text{ mm.} \end{aligned}$$

So the map distance is

$$(250000 \div 10000) \text{ mm} = 25 \text{ mm.}$$

Hence the corresponding distance on the map is 25 mm.

See Unit 2, Subsection 1.2.

Solution 5Correct answer : 30

The average speed is given by $\frac{\text{distance}}{\text{time}}$ which in this case is $\frac{10}{20}$ km/min.

Since there are 60 minutes in 1 hour, the average speed is

$$\left(\frac{10}{20} \times 60\right) \text{ km/h} = 30 \text{ km/h}.$$

See Unit 2, Subsection 1.3.

Solution 6Correct answer : 3.5

The time taken is 25 minutes to 3pm and 13 minutes to 3:13 pm, giving a total time of 38 minutes.

So the average speed is given by

$$\begin{aligned} \frac{\text{distance}}{\text{time}} &= \frac{2.2}{38} \text{ km/min} \\ &= \left(\frac{2.2}{38} \times 60\right) \text{ km/h} \\ &= 3.474 \text{ km/h}. \end{aligned}$$

So the average speed is 3.5 km/h (to 2 s.f.).

See Unit 2, Subsection 1.3.

Solution 7Correct answer : 22

Using the formula, $\text{time} = \frac{\text{distance}}{\text{average speed}}$ gives

$$\text{time} = \frac{20}{55} \text{ hours}.$$

Multiplying by 60 to convert the time to minutes gives

$$\begin{aligned} \text{time} &= \left(\frac{20}{55} \times 60\right) \text{ minutes} \\ &= 21.8 \text{ minutes}. \end{aligned}$$

To the nearest minute, this gives 22 minutes.

See Unit 2, Subsection 1.4.

Solution 8Correct answer : 25

In 1 second, the distance travelled is $7 \text{ m} = (7 \div 1000) \text{ km} = 0.007 \text{ km}$.

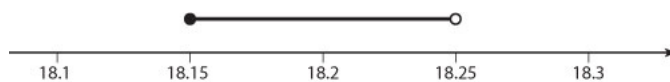
So in 1 hour, the distance travelled is $(0.007 \times 60 \times 60) \text{ km} = 25.2 \text{ km}$.

Hence to the nearest integer, the speed is 25 km/h.

See Unit 2, Subsection 2.2.

Solution 9Correct option : E

The values which round to 18.2 to 3 significant figures are shown on the number line below:



So the correct option is $18.15 \leq v < 18.25$.

See Unit 2, Section 4.

Solution 10

Matching pairs:

$2x + 5$	Multiply the number by 2 and then add 5.
$(x - 4)^2$	Subtract 4 from the number and then square your answer.
$2(x + 5)$	Add 5 to the number and multiply your answer by 2.
$x^2 - 4$	Square the number and then subtract 4.

If you substitute a number into $2x + 5$, you multiply by 2 and then add 5, since multiplication is carried out before addition.

If you substitute a number into $(x - 4)^2$, you work out the bracket first. So you subtract 4 from the number, and then square the answer.

If you substitute a number into $2(x + 5)$, you work out the bracket first. So the first step is to add 5, then multiply the answer by 2.

If you substitute a number into $x^2 - 4$, you work out the power first. So the first step is to square the number and then subtract 4.

See Unit 2, Subsection 3.1.

Solution 11

Correct answer : 8

When $x = -2$, the expression becomes

$$\begin{aligned} (-2 - 2)^2 + 3 \times (-2) + \frac{4}{-2} &= (-4)^2 - 6 - 2 \\ &= 16 - 6 - 2 \\ &= 8. \end{aligned}$$

See Unit 2, Section 3.2.

Solution 12

Matching pairs:

$5(6 + 3x)$	60
$(5x)^2$	100
$(6x + 3)^2$	225
$\frac{5x}{6}$	1.67
$\frac{5}{x+6}$	0.63

When $x = 2$:

$$\begin{aligned} 5(6 + 3x) &= 5 \times (6 + 3 \times 2) \\ &= 5 \times (6 + 6) \\ \text{(a)} \quad &= 5 \times 12 \\ &= 60 \end{aligned}$$

$$\begin{aligned} (5x)^2 &= (5 \times 2)^2 \\ \text{(b)} \quad &= 10^2 \\ &= 10 \times 10 = 100 \end{aligned}$$

$$\begin{aligned} (6x + 3)^2 &= (6 \times 2 + 3)^2 \\ \text{(c)} \quad &= (12 + 3)^2 \\ &= (15)^2 \\ &= 15 \times 15 = 225 \end{aligned}$$

$$\begin{aligned} \frac{5x}{6} &= \frac{5 \times 2}{6} \\ \text{(d)} \quad &= \frac{10}{6} = 1.67 \end{aligned}$$

$$(e) \quad \frac{5}{x+6} = \frac{5}{\frac{2}{5}+6} \\ = \frac{5}{\frac{32}{5}} = 0.63$$

See Unit 2, Subsection 3.2.

Solution 13

Correct answer :

When $n = 32$,

$$C = 5 + 0.1 \times 32 = 5 + 3.2 = 8.2.$$

So the cost is £8.20.

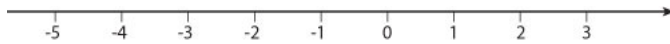
See Unit 2, Subsection 3.2.

Solution 14

Correct option :

Correct option :

From the number line below, we can see that the number -1 is to the right of -4, so -1 is greater than -4.



Hence the inequality is $-1 > -4$.

Another way of writing this is $-4 < -1$.

See Unit 2, Section 4.

Solution 15

Correct option :

The lower limit is 30 and this value can be displayed.

One tenth of the speed is $30 \div 10 = 3$, and so the upper limit is $30 + 3 + 4 = 37$. This value can also be displayed.

So the inequality is $30 \leq v \leq 37$.

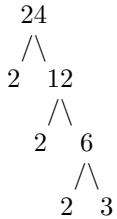
See Unit 2, Section 4.

Unit 3 practice quiz solutions

Solution 1

Correct answer :

Start by drawing the factor tree for 24:



From the factor tree we see that the number 24 factorises as $2^3 \times 3$.

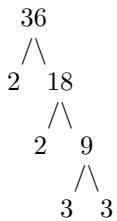
So the largest prime factor is 3.

See Unit 3, Subsection 1.4.

Solution 2

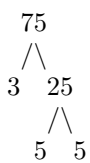
Correct answer :

Start by working out the prime factorisation of 36. One way of doing this is to draw a factor tree as follows



So the prime factorisation of 36 is $2^2 \times 3^2$.

Now we do the same for 75, starting with the factor tree:



So the prime factorisation of 75 is 3×5^2 .

What we need to do now is to find the highest power of each prime factor occurring in any of the numbers. One way of doing this is to write the two factorisations one above another, lining up the primes in each case, as follows.

$$\begin{array}{cccc}
 & 2 & 3 & 5 \\
 36 & 2^2 & 3^2 & \\
 75 & & 3 & 5^2
 \end{array}$$

The highest power of each prime appearing in both factorisations is $2^2 \times 3^2 \times 5^2$.

So the lowest common multiple is 900.

See Unit 3, Subsection 1.4.

Solution 3

Correct option :

Powers of the same base number are multiplied together by adding the indices, that is,

$$a^x \times a^y = a^{x+y}.$$

Hence we have $3^3 \times 3^4 \times 3^5 = 3^{3+4+5} = 3^{12}$.

See Unit 3, Subsection 1.5.

Solution 4

Correct option : D

Powers of the same base number are multiplied together by adding the indices, that is,

$$a^x \times a^y = a^{x+y}.$$

Powers of the same base number are divided by subtracting the indices, that is,

$$\frac{a^x}{a^y} = a^{x-y}.$$

Hence we have $\frac{11^3 \times 11^4}{11^5} = 11^{3+4-5} = 11^2$.

See Unit 3, Subsection 1.5.

Solution 5

Correct option : B

To calculate the sum

$$\frac{5}{6} - \frac{4}{9},$$

first look for a common denominator for the two fractions. Multiplying the two denominators (i.e. 6 and 9) to obtain 54 will always work as a common denominator. The arithmetic involved is simpler using the lowest common multiple, which in this case is 18, so this is what we do: putting the two fractions over a common denominator gives

$$\frac{5 \times 3 - 4 \times 2}{18}.$$

Now simplify the numerator. Remembering BIDMAS, we do the multiplications first to obtain

$$\frac{15 - 8}{18}.$$

This simplifies to

$$\frac{7}{18}.$$

See Unit 3, Subsection 2.3.

Solution 6

Correct option : D

Start by converting the mixed fractions into improper fractions. The mixed fraction $12\frac{2}{3}$ equals $\frac{38}{3}$ and the mixed fraction $1\frac{1}{5}$ equals $\frac{6}{5}$.

So the expression to calculate is

$$\frac{38}{3} \div \frac{6}{5}$$

Practice quizzes for Units 1 to 4 (Set 1)

To divide by a fraction we invert the fraction and multiply, so the expression to calculate is

$$\frac{38}{3} \times \frac{5}{6}$$

Now cancel common factors to get:

$$\frac{19}{3} \times \frac{5}{3}$$

Multiplying the numerators and denominators separately gives

$$\frac{95}{9}$$

See Unit 3, Subsection 2.3.

Solution 7

Correct answer :

This reciprocal of $\frac{4}{5}$ is one divided by the fraction and is obtained by inverting the fraction to get $\frac{5}{4}$. Performing the division gives:

$$\frac{5}{4} = 1.25$$

So the answer is 1.25.

See Unit 3, Subsection 2.3.

Solution 8

Correct answer :

Scientific notation is where a number is written as a number between 1 and 10 multiplied by a power of ten. In this case

$$402\,000 = 4.020 \times 10^5$$

So the answer is 5.

See Unit 3, Subsection 2.5.

Solution 9

Correct option :

Using the laws of numbers and indices,

$$(7.3 \times 10^{-2}) \times (3.6 \times 10^{-3}) = (7.3 \times 3.6) \times 10^{-2-3} = 26.28 \times 10^{-5}.$$

Putting this number into scientific notation means adjusting it so that the decimal part is within the range from 1 to 10 (excluding 10 itself), with a corresponding adjustment to the power of 10. The result obtained is

$$2.628 \times 10^{-4}.$$

See Unit 3, Subsection 2.5.

Solution 10

Correct option :

Using the laws of numbers and indices,

$$\frac{(7.3 \times 10^{-2}) \times (3.6 \times 10^{-3})}{9.9 \times 10^4} = \frac{7.3 \times 3.6}{9.9} \times 10^{-2-3-4} = 2.654545455 \times 10^{-9}.$$

Putting this number into scientific notation means adjusting it so that the decimal part is within the range from 1 to 10 (excluding 10 itself), with a

corresponding adjustment to the power of 10. The result obtained, with the decimal part rounded to four decimal places, is

$$2.6545 \times 10^{-9}.$$

See Unit 3, Subsection 2.5.

Solution 11

Correct answer : 3

First factorise 18 as 9×2 then the square root can be simplified as follows

$$\sqrt{18} = \sqrt{9 \times 2} = \sqrt{9} \times \sqrt{2} = 3\sqrt{2}$$

So the answer is 3.

See Unit 3, Subsection 3.3.

Solution 12

Correct option : B

Start by multiplying the numbers together and multiplying the roots together using the rule $\sqrt{a} \times \sqrt{b} = \sqrt{a \times b}$:

$$8\sqrt{10} \times 7\sqrt{6} = 8 \times 7\sqrt{10 \times 6} = 56 \times \sqrt{10 \times 6}$$

Now consider the number under the square root sign. Now 10 factorises as 2×5 and 6 factorises as 2×3 , so therefore 10×6 factorises as $2^2 \times 3 \times 5$. So the largest square number that is a factor of this number is 4, so the expression is equivalent to $56\sqrt{4 \times 15}$.

This simplifies to $56\sqrt{4}\sqrt{15}$.

So the required answer is $112\sqrt{15}$.

See Unit 3, Subsection 3.3.

Solution 13

Correct option : B

The problem is to divide £300 in the ratio 3:2.

The total number of parts is $3+2=5$,

so each part is 'worth' $\pounds \frac{300}{5} = \pounds 60$.

Hence the first person receives $\pounds 3 \times 60 = \pounds 180$,

and the second person receives $\pounds 2 \times 60 = \pounds 120$.

See Unit 3, Subsection 4.1.

Unit 4 practice quiz solutions

Solution 1

Correct option : ☐ E

Correct option : ☐ F

The following activities are within the P (posing) stage of the PCAI cycle: 'Narrow down a general question and make it specific.' and 'Deciding which measure of pain is the most useful to use in a medical trial.'

'Search the internet for information.' and 'Collect more data.' are within the C (collecting data) stage, 'Compare the averages of two sets of test scores.' and 'Drawing a graph of the speeds of cars measured.' are within the A (analysing) stage and 'After analysing your data, decide whether you need to interview more people.' and 'Write a report summarising your conclusions.' are within the I (interpretation) stage.

See Unit 4, Subsection 1.2.

Solution 2

Correct option : ☐ D

Correct option : ☐ E

Correct option : ☐ F

The following variables are continuous: 'percentage of a person's body weight which is fat', 'length of time from cancer diagnosis to remission' and 'temperature at which a chemical reaction occurs' because they can take *any* value within a certain range.

The remainder 'number of births in Basel in 1968', 'higher education degree classification' and 'membership (or not) of a country in the European Union' are discrete variables because they can only take certain specific values.

See Unit 4, Subsection 2.2.

Solution 3

Correct answer :

The mean is found by adding up the numbers, and dividing the total by the number of data items.

So,

$$\begin{aligned}\text{mean} &= \frac{8 + 4 + 9 + 0 + 6 + 4 + 8 + 3}{8} \\ &= \frac{42}{8} \\ &= 5.25.\end{aligned}$$

Hence the mean of the data is 5.25 (to 2 d.p.).

See Unit 4, Subsection 3.2.

Solution 4

Correct answer :

The median is found by first arranging the data in increasing order and then, since there are an odd number of data items, taking the middle value.

The sorted data list is

1, 2, 2, 6, 8

and hence the median is 2.

See Unit 4, Subsection 3.2.

Solution 5

Correct answer : 34.5

The median is found arranging the data in increasing order and, since in this case the number of data items is even, taking the value half way between the middle two data items.

Since the data list is already sorted, the middle two items are 34 and 35 and hence the median is 34.5.

See Unit 4, Subsection 3.2.

Solution 6

Correct answer : 186.2

By entering the data into Dataplotter, we can see that the mean to one decimal place is 186.2.

Alternatively, the mean is found by adding up the numbers, and dividing the total by the number of data items.

In this case, the sum of all the 16 data values is 2979,

and so the mean can be found from $\frac{2979}{16} = 186.1875$.

The mean rounded to one decimal place is 186.2.

See Unit 4, Subsection 3.2.

Solution 7

Correct answer : 8

The range is the difference between the largest and smallest data values.

In this case the largest value is 8 and the smallest is 0. The difference between these is $8 - 0 = 8$.

So the range is 8.

See Unit 4, Subsection 4.1.

Solution 8

Correct answer : 1.5

We first write the data in increasing order,

1, 2, 6, 8.

Since there are an even number of data items, the median is half way between the two middle values which are 2 and 6. The median is thus 4.

The data less than (and excluding) the median, is then,

1, 2

and since there are an even number of items in this list, the median of this list is half way between the two middle values which are 1 and 2, giving 1.5.

Practice quizzes for Units 1 to 4 (Set 1)

Thus the first quartile is 1.5.

See Unit 4, Subsection 4.2.

Solution 9

Correct answer : 6.5

We first write the data in increasing order,

1, 3, 5, 8

Since there are an even number of data items, the median is half way between the two middle values which are 3 and 5. The median is thus 4 .

The data greater than (and excluding) the median, is then,

5, 8

and since there are an even number of items in this list, the median of this list is half way between the two middle values which are 5 and 8, giving 6.5.

Thus the third quartile is 6.5.

See Unit 4, Subsection 4.2.

Solution 10

Correct answer : 4

We first write the data in increasing order,

1, 3, 5, 7.

Since there are an even number of data items, the median is half way between the two middle values which are 3 and 5. The median is thus 4 .

We can then find the first quartile by considering the data less than (and excluding) the median, that is: 1, 3.

Since there are an even number of items in this list, the median of this list is half way between the two middle values which are 1 and 3, giving 2.

Thus the first quartile is 2.

By considering the part of the original data set greater than (and excluding) its mean, that is, 5, 7, we can find the third quartile.

As there are an even number of items in this list, the median of this list is half way between the two middle values which are 5 and 7, giving 6.

The third quartile is thus 6.

The interquartile range is the difference between the quartiles, which is $6 - 2 = 4$.

So the interquartile range is 4.

See Unit 4, Subsection 4.2.

Solution 11

Correct answer : 47

The range is the difference between the largest and smallest data values.

In this case the largest value is 49 and the smallest is 2. The difference between these is $49 - 2 = 47$.

So the range is 47.

See Unit 4, Subsection 4.1.